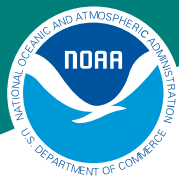


# NOAA's West Coast Center for Oceans & Human Health

2011



**NOAA  
FISHERIES  
SERVICE**



We are drawn to the oceans. At least 37% of the U.S. population lives in coastal counties, which comprise only 17% of the land area. Between 1960 and 1990, coastal area population grew by more than 38 million people. And these numbers are continuing to increase daily. With this population increase comes greater human interaction with and impact on the oceans.

The oceans are a tremendous source of biodiversity, production, and inspiration; they support many human uses from transportation to recreation, provide sustenance, play a key role in controlling greenhouse gases and generating weather patterns, and support a rich diversity of life from microbes to whales. Despite our critical linkage to the oceans, very little is known about the relationships between oceans and human health. In July 2004, the National Oceanic and Atmospheric Administration (NOAA) created three Centers to address this serious gap. The NOAA West Coast Center for Oceans and Human Health (West Coast Center) consists of a multidisciplinary research team of federal, academic, and non-profit organization scientists.

Based at the Northwest Fisheries Science Center in Seattle, WA, the West Coast Center consists of a multidisciplinary research team of federal, academic, and non-profit organization scientists who are working together to understand, predict, and reduce both direct and indirect effects of the oceans on human health to assist natural resource and public health managers. West Coast Center scientists are conducting this research using an ecosystem-based approach that includes studies of infectious microorganisms, toxin-producing algae, shellfish, fish, and marine mammals, as well as important environmental factors, including climate variability and change.

## Program Goals and Objectives

Three overarching goals for the NOAA Oceans and Human Health Initiative (OHHI) guide the West Coast Center's research objectives. The three goals are: (1) lead the development of early warning systems to forecast threats and predict long-term risks to human health throughout U.S. coastal and Great Lakes waters; (2) investigate and optimize health benefits from the sea; and (3) develop a robust oceans and human health community working across disciplines and institutions to improve public health.

Through the West Coast Center's innovative and interdisciplinary OHH research, we hope to foster and facilitate strong partnerships among agencies, academia and the private sector on oceans and human health. The West Coast Center's core research strives to provide a better understanding of seafood benefits and risks, advances in early warning or forecasting tools, and better assessment of ecosystem change and its effect on human health that will ensure seafood is safe to eat and beaches are safe for recreation.

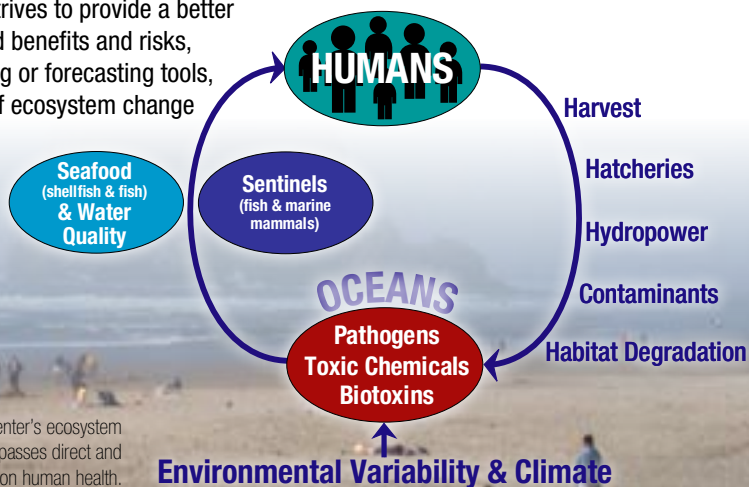
## Research Objectives

- Understand how pathogens, biotoxins, and toxic chemicals accumulate and are retained in shellfish and fish.
- Develop tools and technologies to identify, forecast, and mitigate the risks that contaminated shellfish pose to consumers.
- Evaluate the impacts of environmental change on pathogen prevalence, harmful algal blooms, and pathogen and toxic chemical input.
- Use fish and marine mammals as sentinels to evaluate existing and emerging pathogens and the effects of biotoxins and toxic chemicals, including interactions among stressors, on human health.
- Develop methods to forecast and reduce threats to human health.

## Learn More & Come See Us in Action

Sharing our work with other scientists, policymakers, resource managers, and the public is important to us. To learn more about what we do, please visit our website at: [www.nwfsc.noaa.gov](http://www.nwfsc.noaa.gov) and follow @NOAA\_NWFSC on Twitter. To obtain additional information, please call 206-860-3200.

A diagram illustrating the WC Center's ecosystem based approach that encompasses direct and indirect effects of the oceans on human health.



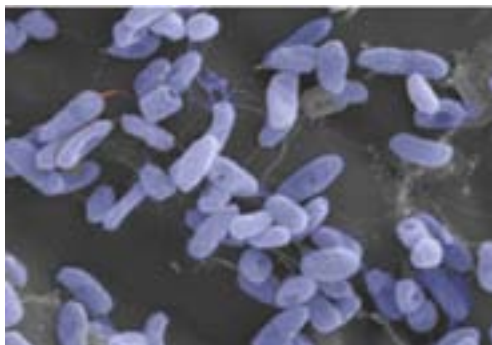
*In the U.S., there are approximately 25,000 cases of foodborne-disease that require hospitalization every year. Waterborne bacterial infections may be the cause of as many as half of these cases. As part of its oceans and human health studies, WC Center scientists are investigating the relationship between naturally occurring *Vibrio* species, bacteria that cause severe gastroenteritis in healthy individuals who consume affected shellfish, and their association with shellfish and contribution to human disease.*

### Current Research

#### Sound Toxins Project

Sound Toxins is a collaborative study to collect scientific information for an early warning of harmful algal bloom (HAB) and pathogen events in Puget Sound. Biotoxins such as domoic acid and saxitoxin produced by various phytoplankton species (i.e., *Pseudo-nitzschia*, *Alexandrium*, *Heterosigma*), pathogens (e.g., *Vibrio parahaemolyticus*) and environmental parameters (i.e., temperature, salinity, nutrients) are monitored to better understand the relationships between the presence of toxins and certain environmental factors. This information is being used to build local monitoring capacity for the protection of human health.

The West Coast Center began a monitoring program with the Washington State Department of Health, shellfish farmers, Tribes, and Marine Science Centers in Puget Sound. This has given local organizations the ability to monitor for toxic organisms at their sites of interest, giving them an early warning of local HAB and *Vibrio* events.



*Vibrio* species have certain characteristics that enable them to colonize shellfish and cause disease, including the ability to attach to and colonize host cells.

#### Climatic Factors Influencing HAB and *Vibrio* Events

In earlier research, the West Coast Center quantified the influence of the local and large-scale climate on temperature, salinity, density and stratification of Puget Sound that led to specific testable hypotheses about the influence of climate on toxic blooms. We recently conducted research that provides valuable information on mechanisms linking the local (e.g., upwelling winds) and large-scale (e.g., ENSO) climate to *Pseudo-nitzschia* abundance and domoic acid in razor clams for the outer Washington coast. In addition, this work is now being extended to determine if the same models can be used to assess the risk of pathogenic *Vibrio parahaemolyticus* in shellfish prior to harvest.

This information will be used to develop HAB risk forecasts and advanced warning of toxic events at time scales ranging from a few weeks out to several decades into the future, and greatly reduce public health risks and economic losses to coastal communities.

#### Development of Marine Biosensors to Build Health Early Warning Systems

The West Coast Center is currently working on advanced biosensors for use in Health Early Warning Systems (HEWS) that will provide real time forecasting tools for public health managers. An autonomous sensing system to detect multiple HAB and pathogen species in situ would provide early warning of these events and reduce fisheries and economic losses. The Environmental Sample Processor (ESP) is an advanced platform that conducts automated in situ collection and analysis of water samples using genetic probes specific to target organisms such as harmful algal species and pathogens, and telemeters the results to shore in near real-time.

It is envisioned that novel observing technologies such as the ESP would be integrated with other environmental, oceanographic, and weather data systems to form an advanced early warning network.

### Conclusion

The West Coast Center for Oceans and Human Health works to develop more comprehensive linkages between oceans and human health and ensure that we can continue to benefit from the critical services the oceans provide. Research at the West Coast Center will help close critical gaps and assist resource and human health managers. As a result of this research, we will be able to develop tools and models that better mitigate, predict, and forecast current and potential threats to human health.

NOAA's current key partners in the West Coast Center include the University of Washington (Seattle, WA), Oregon State University (Corvallis, OR), University of Maryland (Baltimore, MD), University of Southern Mississippi Gulf Coast Research Laboratory (Ocean Springs, MS), the Marine Mammal Center (Sausalito, CA), Washington State Department of Health, and NOAA's Alaska Fisheries Science Center and National Weather Service (Seattle, WA).



The Environmental Sample Processor is an autonomous buoy system that can detect harmful phytoplankton and bacterial pathogens using DNA-based technologies. This is the core system without its pressure housing, and is currently undergoing laboratory testing.